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POLYMERIZED WHEY PROTEIN ISOLATES IMPACT ON ORGANOLEPTIC PROPERTIES OF CAMEL MILK STIRRED YOGHURT

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Many nutraceutical attributes are related to camel milk i.e anti-carcinogenic, anti-hepatic, anti-diabetic and anti-hypertension bioactive components. Polymerized whey protein isolates is important for its functional and nutritional properties in various dairy food products. 10% w/v polymerized whey protein isolates (PWPI) were prepared by heating whey proteins at 85^0C for 30 minutes at pH 7. Stirred yoghurt from camel milk was prepared by using PWPI as thickening agent in various concentrations of 2, 4, 6 and 8% and compared with the control (without PWPI). All the samples were studied with the interval of 7 days up till 21st day for organoleptic properties. There was no significant effect of storage days on all these constituents of all yoghurt samples. Results showed that PWPI can be a good source to have desired organoleptic characteristics in camel milk stirred yoghurt properties.

Keywords: camel milk, polymerized whey protein isolates, stirred yoghurt, organoleptic properties

INTRODUCTION

The camel possesses an unusual importance because of its anatomical and physiological makeup to maintain life in extreme severe weather conditions and on paltry vegetation especially in the hot dry and partial dry areas (Williamson *et al.* 1978). Camel is the most efficient domestic animal that can transform poor quality pasture into meat, milk and animal power with minimal negative effect on its environment. They have already proved to be food security animals and contribute to the economies (Tegegn, 1989).It is supposed to be the integral part of non-urban economic system for the deprived and minor farm owners by doing various day to day operations of draught, riding, farm activities, generating dairy, various meats and hair (Bhakat and Sahani 2001). Camel is the most efficient domestic animal that can transform poor quality pasture into meat, milk and animal power with minimal negative effect on its environment. They have already proved to be food security animals and contribute to the economies of the pastoralist (Tegegn, 1989). Camel is the most reasonable and proficient animal in the arid and semiarid range lands of Pakistan. It is broadly accepted, camels which are dromedary produce milk of high quality and nutritious, can efficiently tolerate harsh conditions of environment such as paltry vegetation, lack of water and sultry temperature than other bovine species for long term of time (Al-Eknah 2000). The environmental situation and supervision of camels can increase production of milk in camels. Lactation period of camel is nine months to eighteen months on average it is twelve months. Arabian camels can produce on an average 2270 liters of milk per year and almost 3.4 to 6.4 liter of milk in a day with an average of 5.03 liter per day (Yagil*et al.* 1979). When reproduction ability of camels is enhanced, a great impact on the milk production from camels observed (Faye 2005).

Camel milk is unique from other ruminant milk in terms of composition as well as functionality as it contains high concentration of immunoglobulins and insulin. It is high in vitamins (A, riboflavin, C and E) and minerals (Na, K, Fe, Cu, Zn and Mg) and low in protein, sugar and cholesterol (del Angel *et al.* 2006; Kamal *et al.* 2007).

Vitamins present in camel milk have antioxidant activity and helpful in controlling tissue damage caused by harmful substances (Al-Hashem 2009). In short, camel milk is supposed to have a medicinal value. The composition of camel milk has been widely studied throughout the world and thousands of references are available especially with regard to milk consumed by humans. The literature data mainly concerns cow milk, which represents 85% of the milk consumed in the world and, to a lesser extent, goat and sheep milk. Studies on other dairy animals (buffalo, yak, mare, and camel) are rather scarce, in spite of their nutritional interest (Faye, 2005).

Fermented milk products are utilized as food with added nutritional value and have a large growing market for dairy industry. Among these products, stirred yoghurt has greater importance for the consumers who observe the appearance and texture as reception criteria. Wheying-off, also known as syneresis is the most common fault when it is stored. The producers attempt to put off syneresis and make sure texture by increasing total solids constituents of camel milk, by the addition of milk powder and stabilizers such as starch, pectin and gelatin. In addition to these typically adopted methods to be able to improve texture as

well as the consistency, anionic polysaccharides from the particular tissues of many fruits (Karimand Gooklani 1987) and whey protein polymers/isolates (Kazmierski 2003) are also used as gelling agents in stirred yoghurt. The latter can be made by applying heat treatment. It is not only helpful to increase product safety simply by microbiologically point of view, but also useful to improve the organoleptic features regarding milk products simply by having an influence on the particular features regarding dairy protein (Li 2006). Whey powder is mainly consist of 35-80% of whey proteins as major component while whey proteins isolate which in turn consist of 80-90% whey proteins as main constituent (Brans *et al.*, 2004). Whey protein polymerization can result in gel creation by different necessary protein concentrations of whey. The particular inclusion regarding stabilizers for instance pectin and also improving total solids regarding dairy are usually the most frequent strategies which can be followed to boost uniformity and mouth feel of yoghurt. It is observed that yoghurt syneresis and viscosity may be better simply by addition of milk together with polymers of whey protein isolates (Sakandar*et al*. 2014). Polymerized whey protein are defined as aggregates of whey protein which are soluble and developed when thermally treated at an ambient temperature and concentration of protein which usually develop a gel but do not owing to low concentration of salt (AOAC. 2000).

MATERIALS AND METHODS

MATERIALS

Milk was bought from the nomads who were in the vicinity of Faisalabad, Pakistan. The starter culture which was used in the formation of stirred yoghurt from camel milk was mixed culture NESTLE YOGHURT bought from local market in Faisalabad, Pakistan which was consist of different strains of bacteria.

Whey protein isolate was bought from local market in Faisalabad, Pakistan then it was polymerized to use in camel milk stirred yoghurt.

Preparation of polymerized whey proteins:Polymerized whey protein isolates were prepared according to the method adopted by Sakandar et al 2014.

Preliminary trials with various concentrations of PWP: Various concentrations of polymerized whey protein were used to demonstrate the quality of stirred camel milk yoghurt which is given in table 1. Five samples were prepared with different concentrations of polymerized whey protein. Control sample has no polymerized whey protein while other four has various concentrations of polymerized whey protein. Sample 1,2,3,4 has 2%, 4%,6%,8% polymerized whey protein respectively.

STATISTICAL ANALYSIS

Results were analyzed by using 2 way repeated Complete Randomized Block and by ANOVA.

RESULTS AND DISCUSSION

PRELIMINARY TRIALS RESULTS

The viscosity of stirred yoghurt made from the camel milk with different concentrations of polymerized whey proteins was analyzed. Results showed that the stirred yoghurt sample with 0 percent polymerized whey protein has least viscosity while the sample with 8% polymerized whey protein has maximum viscosity as compared to 2%, 4% and 6% polymerized whey protein.

Color: The color of the product is also very important factor in relation to consumer's perception. It is an important quality attribute of a product. The mean values for color of yoghurt samples are given in table 2. The overall means for color of yoghurt samples with respect to treatment varies from 6.75 to 5.55 and with respect to storage days varies from 7.11 to 4.54. The treatment mean difference is calculated as 1.25 but with respect to storage time it is 2.57. This shows that results are significant. The storage time had shown negative effect on the color of yoghurt. Color of stirred yoghurt samples was significant with respect to the storage time and polymerized whey protein.

The results of present study are in accordance with the results obtained by Aryana and McGrew, (2007) when studied the quality attributes of yoghurt also observed color changes. Tarakci and Kucukoner, (2003) found that color changes negatively during storage when studied the physicochemical, sensory and microbiological characteristics of yoghurt during storage.

Appearance: The appearance is one of the main characteristics in yoghurt that attract the consumers and enhance the perceiving value of the food products.

The mean values for appearance of yoghurt samples are given in table 3. The overall means for appearance of yoghurt samples with respect to treatment varies from 6.64-5.58 and with respect to storage days varies from 7.5 to 5.2. The treatment mean difference is calculated as 1.06 but with respect to storage time it is 2.3. This shows that results are significant.

At the end of storage appearance of yoghurt was found to be effected significantly and was not acceptable which ultimately deteriorate the quality of yoghurt. It is observed from the results that the appearance of yoghurt samples were significant with respect to the storage time and PWP interaction.

The results of current study are in agreement with the results of Farooq and Haque, (1992) when studied the sugar esters effect on properties of yoghurt. Tarakci and Kucukoner, (2003) reported similar results and found decrease in scores of appearance of yoghurt during storage.

Flavor: In sensory evaluation flavor of the product is the most important factor for determining consumer's response. The flavor of stirred yoghurt is due to the production of volatile compounds through thermal breakdown of some constituents of milk in which one important aroma producing compound is acetaldehyde.

Table 1: Concentrations of PWP

Sample	%PWP
T_0	-
T_1	2
T_2	4
T_3	6
T_4	8

Table 2: Effect of polymerized whey protein and storage time on the color of stirred yoghurt

Treatments	Days of stroage				
	0	7	14	21	Mean
T_0	6.5 cd	6.6 c	5.9 e	3.2 i	5.55 d
T_1	6.7 c	5.7 e	4.7 g	4.6 gh	5.47 d
T_2	7.2 b	6.7 c	5.7 e	4.4 h	6.02 c
T_3	7.3 b	7.2 b	6.2 d	5.1 f	6.50 b
T_4	7.5 a	7.2 b	6.6 c	5.4 f	6.7542 a
Total Means	7.11 a	6.73 b	5.84 c	4.54	

Table 3: Effect of polymerized whey protein and storage time on appearance of stirred yoghurt

Treatments	Days of stroage				
	0	7	14	21	Mean
T_0	6.6 c	6.5 c	5.8 d	3.2 g	5.58 c
T_1	6.7 c	5.8 d	4.7 ef	4.4 f	5.42 c
T_2	7.2 ab	6.7 bc	5.7 d	4.4 f	6.01 b
T_3	7.5 a	7.2 a	6.2 cd	5.2 e	6.55 a
T_4	7.5 a	7.2 a	6.6 c	5.2 e	6.64 a
Total Means	7.11 a	6.73 b	5.84 c	4.48 d	

Table 4: Mean values for the effect of polymerized whey protein and storage time on the flavor of stirred yoghurt

Treatments	Days of stroage				
	0	7	14	21	Mean
T_0	6.7 c	6.6 c	5.9 be	3.2 j	5.61 d
T_1	6.7 c	5.7 ef	4.7 gh	4.6 hi	5.46 e
T_2	7.2 b	6.7 c	5.7 ef	4.4 i	6.02 c
T_3	7.5 ab	7.2 b	6.1 d	5 g	6.48 b
T_4	7.5 a	7.2 b	6.6 c	5.5 f	6.73 a
Total Means	7.15 a	6.73 b	5.83 c	4.54 d	

Table 5: Mean values for the effect of polymerized whey protein and storage time on the mouth feel of yoghurt

Treatments	Days of stroage				
	0	7	14	21	Mean
T_0	6.5 d	6.6 d	5.9 f	3.2 j	5.57 d
T_1	6.6 d	5.8 f	4.7 h	4.5 hi	5.44 e
T_2	7.2 c	6.7 d	5.7 f	4.4 i	6.02 c
T_3	7.5 ab	7.2 bc	6.2 e	5.1 g	6.54 b
T_4	7.6 a	7.2 bc	6.6 d	5.2 g	6.68 a
Total Means	7.12 a	6.75 b	5.85 c	4.49 d	

The mean values for flavor of yoghurt samples are given in table 4. The overall means for flavor of yoghurt samples with respect to treatment varies from 6.73 to 5.61 and with respect to storage days varies from 7.15 to 4.54. The treatment mean difference is calculated as 1.12 but with respect to storage time it is 2.61. This shows that results are highly significant.

The decrease in flavor scores is related with the proteolytic activity of bacteria and the production of higher acidity (Abrahamsen, 1978). Loss of flavor is also attributed to fat and protein degradation and minor development of sharp flavor produced by coliform bacteria, clostridiums spp. and other organisms.

The results are in accordance with the findings of Farooq and Haque, 1992 and Tarakci and Kucukoner, 2003, they found a decrease in flavor of yoghurt during storage.

Mouthfeel: Mouthfeel is a category of sensations that occurs in the oral cavity and it is an important sensory property of yoghurt products. Authors distinguished mouthfeel from textural properties like firmness and hardness. Mouth is very important factor in the perception of product.

The mean values for mouthfeel of yoghurt samples are given in table 5. The overall means for mouthfeel of yoghurt samples with respect to treatment varies from 6.68 to 5.57 and with respect to storage days varies from 7.12 to 4.49. The treatment mean difference is calculated as 1.11 but with respect to storage time it is 2.63. This shows that results are highly significant.

It is observed from the results that the mouthfeel of yoghurt samples were highly significant with respect to the storage time and PWP interaction.

These results are in favor of Abrahamsen, (1978) who found that acidity development continued in yoghurt during storage even at 6 C when studied the acetaldehyde and lactic acid content at different temperatures in yogurt.

CONCLUSIONS

Polymerized whey protein isolates proved to be a suitable thickening agent for camel milk stirred yoghurt to enhance???. The optimal concentration of PWP was 8% which showed good sensory attributes. Results from this study revealed that polymerized whey protein as a stabilizer may be useful to improve the organoleptic properties of stirred yoghurt along with curd development.

REFRENCES

Abrahamsane, N. M. and D. W. Reed. 1993. Pasteurizing camel's milk and making camel's cheese in Mauritania. Spirit of enterprise: The 1993 Rolex Awards. pp: 72-75.

Al-Eknah, M. M. 2000. Reproduction in Old World camels.Anim. Reprod. Sci. 60-61: 583-592.

Al-Hashem, F. 2009. Camel milk protects against aluminium chloride-induced toxicity in the liver and kidney of white albino rats. Am. J. Biochem. Biotechnol. 5: 98-108.

AOAC. 2000. Association of Official Analytical Chemists. Official methods of analysis. 17th edition published by AOAC. Po box 540. Benjamin Franklin station, Washington, DC., USA.

Aryana, K.J. and P. McGrew. 2007. Quality attributes of yogurt with Lactobacillus casei and various prebiotics. LWT. 40: 1808-1814

Bhakat, C. and M. S. Sahani. 2001. Impact of camel production system on the sustainability of marginal farmers in hot arid villages of Thardesert. Indian J. Anim. Res. 35:10-14.

Brans, G., C. G. P. H. Schroe¨n, R. G. M. van der Sman, and R. M. Boom. 2004. Membrane fractionation of milk: state of the art and challenges. J Membrane Sci, 243: 263–272.

del Angel, C. R., D. G and Dalgleish, 2006. Structures and some properties of soluble protein complexes formed by the heating of reconstituted skim milk powder. Food Research International, 39: 472–479.

EI-Erian, A.F.M. 1979. Studies on camel milk in the Kingdom of Saudi Arabia. Proc. 2nd Arab Conf. Food Sci. Technol., Saudi Arabia.

Farooq, K. and Z. U. Haque. 1992. Effect of sugar esters on the textural properties of non-fat low calorie yogurt. J. Dairy Sci. 75: 2676-2680

Faye, B. 2005.Productivity potential of camels.Proc. of Intern.Workshop.Desertification Combat and Food Safety.The added value of camel producers.Ashkabad (Turkmenistqan), 19-22 April, 2004. NATO science Series, I: Life and Behavioral Sciences, Vol. 362. B. Faye and P. Esenov (Eds), IOS Press Publ., Amsterdam (The Netherlands). pp: 127-134

Kamal, A. M., O. A. Salama and K. M. El-saied. 2007. Changes in amino acid profile of camel milk protein during the early lactation. Int. J. Dairy. Hepatol. 32: 39-47.

Karim, G. and I. Gooklani. 1987. Studies on the gross components of camel milk in Turkman Sahara. 1. Vet. Faculty, Tehran, Iran, 42.

Kazmierski, M., L. Wicker, and M. Corredig. 2003. Interactions of b-lactoglobulin and high-methoxylpectins in acidified systems. J of Food Sci, 68: 1673-1679.

Li, J. C. and M. R. Guo. 2006. Effects of polymerized whey proteins on consistency and water-holding properties of goat's milk yogurt. J of Food Sci, 71: 34-C38.

Sakandar HA, Imran M, Huma N, Ahmad S, Aslam HKW (2014) Effectsof Polymerized Whey Proteins Isolates on the Quality of Stirred Yoghurt made from Camel Milk. J Food Process Technol 5: 350. doi:10.4172/2157-7110.1000350

Tarakci, Z. and E. Kucukoner. 2003. Physical, chemical, microbiological and sensory characteristics of some fruit-flavored yoghurt. Int. J. Dairy. 14: 10-14.

Tegegn, T. 1989. Camel pastoralism as food system in Ethiopia.Proceedings of the IDRC/O; CA workshop in April, 1989. IDR, AAU in cooperation with SIAS, Uppsala.

Tegegn, T. 1989. Camel pastoralism as food system in Ethiopia.Proceedings of the IDRC/O; CA workshop in April, 1989. IDR, AAU in cooperation with SIAS, Uppsala.

Williamson, G. and W. T. A. Payne. 1978. An Introduction to Animal Husbandry in the Tropics. 3rd Ed., London. pp: 484-518.

Yagil, R., Z. Etzion and J. Ganani, 1979. Camel thyroid metabolism: The effect of season and dehydration. J. App. Physiol. 45: 540-544.